United States
Environmental
Protection
Agency

Office of Air Quality Planning and Standards
Outreach and Information Division
National Air Data Group
Research Triangle Park, NC 27711

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AQS Monitoring QA/QC

Concept of Operations

VERSION 1.2

Date Revised: December 4 2012

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U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF AIR QUALITY PLANNING AND STANDARDS
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Table of Contents

Revision History

Date	Version	Description of Revision or Change	Author
Nov. 16, 2012	0.9	Imported information into ConOps template.	Robert Coats
Nov. 27, 2012	1.0	Update from internal EPA Review	Robert Coats
Nov. 28, 2012	1.1	Updates from Mike Papp	Robert Coats
Dec 4, 2012	1.2	Field name corrections	Bill Frietsche

Executive Summary

The purpose of this project is to enhance AQS to support new monitoring program Quality Assurance / Quality Control (QA/QC) assessments (audits), while at the same time simplifying the submission of existing types of QA/QC information.

The requirements for Quality Assurance and Quality Control for ambient air quality monitoring programs are specified in 40 CFR Part 58 Appendix A. These primarily relate to criteria pollutants. Other programs, such as the National Air Toxics Trends Stations (NAATS) program, the Chemical Speciation Network (CSN), and the Photochemical Assessment Monitoring Stations (PAMS) have additional monitoring program QA/QC requirements.

AQS presently supports monitoring QA through by accepting two input transaction types, Precision (RP) and Accuracy (RA), and via four output programs, the Precision and Accuracy Raw Data Report (AMP250), the Precision Data Report (AMP246), the Accuracy Data Report (AMP247), and the Data Quality Indicator Report (AMP255).

Issues:

1. The present AQS transactions and output reports only support seven of the 12 QA/QC assessments required by 40 CFR Part 58 Appendix A. The do not support any of the QA/QC assessments required by either the NATTS program or the CSN program.
2. Because the two present input transactions are used to support multiple types of assessments, the fields on each transaction have different meanings based on the assessment type being submitted. As a result, usage of these transactions is confusing and error intensive for users.

The enhancement proposed by this document will resolve these issues by defining a new set of AQS transactions that correspond one-to-one with the types of assessments required by 40 CFR Part 58 Appendix A and the NATTS, CSN, and PAMS programs. Each transaction will have exactly the fields required to submit data for its respective assessment, and will use field names that correspond to the terms used in the regulatory or guidance documentation. (This will remove ambiguity and confusion about how data for specific QA/QC assessments should be submitted to AQS.) Additionally, the AQS Data Quality Indicator Report will be enhanced to provide all of the statistical results required by Appendix A.

1 Scope

1.1 Identification

This document is the Concept of Operations for the EPA Air Quality System (AQS) Monitoring QA enhancement project.

1.2 Document Overview

This document describes the characteristics of the desired system enhancement from a user perspective. This document is intended to communicate the overall qualitative and quantitative characteristics of the proposed system enhancement to project stakeholders (AQS users, software developers, and EPA management). This is a product oriented document – i.e. it describes the resulting product characteristics.

This document is intended to provide the initial **definition** of the desired system enhancements. It is written using terminology and notation that can be verified by the users, while at the same time, is intended to be sufficiently complete and non-ambiguous to allow the scope and cost of the enhancement effort to be estimated.

This document provides the product boundaries for the system enhancement. i.e. What product/system characteristics should be or should not be included enhancement.

1.2.1 Relationship to System Development Life Cycle

This is the first work product associated with a new product/project (which can be either a completely new system or an enhancement to an existing system). It is created before and intended to serve as the basis for the following:

- Detailed Requirements Definition
- System Design
- Software Development

1.3 System Overview

The primary purpose of AQS is to support EPA's regulatory mission, by hosting the ambient air quality monitoring data that serves as the basis for determining compliance with the Clean Air Act and amendments. AQS contains ambient measurements from thousands of monitoring stations around the country that have been collecting data for many decades. This data is submitted by a variety of monitoring organizations, such as state agencies, local agencies, and tribal agencies. In addition to the monitoring data, AQS stores the quality assurance information for the monitoring programs for each of the organizations that submit ambient measurement data. AQS is presently in production operation.

The requirements for Quality Assurance and Quality Control for ambient air quality monitoring programs are specified in 40 CFR Part 58 Appendix A. These primarily relate to criteria pollutants. Other programs, such as the NAATS program, the CSN program, and the PAMS program have additional monitoring program QA/QC requirements.

1.3.1 System Inputs

With the proposed enhancement, AQS will support the following set of QA/QC assessments:

1. 1 Point QC for SO2, NO2, O3, CO
2. Annual Performance Evaluation for SO2, NO2, O3, CO
3. Flow Rate Verification
4. Semi-Annual Flow Rate Audit
5. Performance Evaluation Program (PEP) for PM2.5 and PM10-2.5
6. Pb Analysis Audit
7. National Performance Audit Program (NPAP)
8. Pb PEP
9. Collocated Pb PEP
10. Field Proficiency Test
11. Lab Proficiency Test
12. Duplicate
13. Replicate
14. AA - PGVP (USEPA Ambient Air Protocol Gas Verification Program)
15. Ozone SRP and Ozone Transfer Standard Verifications
16. Technical Systems Audit (TSA)
17. Audit of Data Quality

AQS will also be enhanced to support the submission and tracking of the Quality Management Plans and Quality Assurance Project Plans required by 40 CFR Part 58 Appendix A.

1.3.2 System Outputs

AQS will be enhanced as follows:

1. The Data Quality Indicator Report (AMP255) will be enhanced to report all QA/QC assessment statistics required by 40 CFR Part 58 Appendix A.
2. A new Raw QA/QC Data Report will be developed to provide a formatted report of the QA/QC assessment data as submitted.

1.4 Acronyms and Abbreviations

AQS	Air Quality System
ARM	Approved Regional Method
CFR	Code of Federal Regulations
CSN	Chemical Speciation Network
FEM	Federal Equivalent Method
FRM	Federal Reference Method
NATTS	National Air Toxics Trends Stations
NPAP	National Performance Assessment Program
OAQPS	Office of Air Quality Planning and Standards
PAMS	Photochemical Assessment Monitoring Stations
PEP	Performance Evaluation Program
POC	Parameter Occurances Code

PQAO	Primary Quality Assurance Organization
QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan
SPM	Special Purpose Monitor
SRP	Standard Reference Photometer
TSA	Technical Systems Audit

1.5 Definition of Terms

2 References

1. 40 CFR Part 58 Appendix A, Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)

2. Technical Assistance Document for the National Air Toxics Trends Stations Program Revision 2 (NATTS TAD) April 1, 2009 http://www.epa.gov/ttn/amtic/files/ambient/airtox/nattsTADRevision2_508Compliant.pdf

3. QA Handbook for Air Pollution Measurement Systems: Volume II: Ambient Air Quality Monitoring Program EPA-454/B-08-003, December 2008 http://www.epa.gov/ttn/amtic/files/ambient/pm25/qa/QA-Handbook-Vol-II.pdf

3 Present System or Configuration

3.1 Background, Objectives, and Scope

As noted in the System Overview, AQS is the primary EPA repository for ambient air quality monitoring information. This includes 1) the measurement data itself, 2) the metadata for the sites (locations) where measurements are taken and the monitoring equipment utilized to collect and analyze samples, and 3) the QA/QC information for the monitoring process.

3.2 Operational Policies and Constraints

1. 40 CFR Part 58 Appendix A, Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)
2. Technical Assistance Document for the National Air Toxics Trends Stations Program Revision 2 (NATTS TAD) April 1, 2009
3. QA Handbook for Air Pollution Measurement Systems: Volume II: Ambient Air Quality Monitoring Program EPA-454/B-08-003, December 2008

3.3 Description of Present System or Configuration

The following are the descriptions of the workflows for the present data handling of supported assessments and quality documents:

3.3.1 1-Point QC Assessments for NO2, SO2, O3, and CO

3.3.1.1 Background

1-Point QC Assessments are defined in 40 CFR Part 58 Appendix A Sections 3.2.1 and 4.1. This assessment is used to calculate the precision and bias of gaseous monitors.

3.3.1.2 Input Transaction

This assessment is submitted to AQS via an RP transaction. The following provides the definition of the fields submitted:

Field No.	Field Name	Definition
1	Transaction Type	Literal string ‘RP’
2	Action Indicator	Single character code to indicate whether to Insert, Update, or Delete data (‘I’, ‘U’, ‘D’)
3	State Code / Tribal Indicator	FIPS state code or tribal indicator – ‘TT’
4	County Code / Tribal Code	FIPS County code or FIPS Tribal Code
5	Site ID	Four digit number to uniquely identify site in county.
6	Parameter	AQS code for physical quantity being measured by monitor.

Field No.	Field Name	Definition
7	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter; i.e. when there are more than one monitor for a parameter at a site, they must have different POCs.
8	Precision ID	Number (starting with 1) of the precision check for the day.
9	Duration Code	Duration code for sample measurement data for the monitor.
10	Reported Unit	Units of measure of the concentration.
11	Actual Method	AQS method code for the monitor.
12	Precision Date	Date precision check performed.
13	Actual Value	Known concentration of the gas standard used to challenge monitor.
14		Field not used
15	Indicated Value	Concentration measured by monitor

3.3.1.3 AQS Outputs

1-Point QC Assessments are presently output by AQS by the following standard reports:

- Precision Report (AMP246)
- P&A Raw Data Report (AMP250)
- Data Quality Indicator Report (AMP255)

3.3.2 Annual Performance Evaluation Assessments for NO2, SO2, O3, and CO

3.3.2.1 Background

Annual Performance Evaluation assessments for NO2, SO2, O3, and CO are defined in 40 CFR Part 58 Appendix A Sections 3.2.2 and 4.1.4. This assessment is used to verify the results obtained from the one-point QC checks and to validate those results across a range of concentration levels.

3.3.2.2 Input Transaction

Field No.	Field Name	Definition
1	Transaction Type	Literal string ‘RA’

Field No.	Field Name	Definition
2	Action Indicator	Single character code to indicate whether to Insert, Update, or Delete data ('I', 'U', 'D')
3	State Code / Tribal Indicator	FIPS state code or tribal indicator – 'TT'
4	County Code / Tribal Code	FIPS County code or FIPS Tribal Code
5	Site ID	Four digit number to uniquely identify site in county.
6	Parameter	AQS code for physical quantity being measured by monitor.
7	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter; i.e. when there are more than one monitor for a parameter at a site, they must have different POCs.
8	Accuracy Audit ID Number	Number (starting with 1) to uniquely identify assessment for day.
9	Duration Code	Duration code for sample measurement data for the monitor.
10	Reported Unit	Units of measure of the concentration.
11	Method Code	AQS method code for the monitor.
12		Field not used
13		Field not used
14	Accuracy Date	Date assessment performed
15	Audit Type	Field indicating whether the assessment was performed by the Reporting Organization or another agency.
16	Local Primary Standard	Name of standard method used for audit.
17	Audit Class	Literal String "ANALYTICAL"
18	Accuracy Type	Literal String "PE"
19		Field not used
20		Field not used
21		Field not used
22	First Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
23	First Indicated Value	Concentration measured by monitor of check gas for level.

Field No.	Field Name	Definition
24	Second Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
25	Second Indicated Value	Concentration measured by monitor of check gas for level.
26	Third Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
27	Third Indicated Value	Concentration measured by monitor of check gas for level.
28	Fourth Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
29	Fourth Indicated Value	Concentration measured by monitor of check gas for level.
30	Fifth Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
31	Fifth Indicated Value	Concentration measured by monitor of check gas for level.

3.3.2.3 AQS Outputs

Annual Performance Evaluation assessments are presently output by AQS by the following standard reports:

- Accuracy Report (AMP247)
- P&A Raw Data Report (AMP250)
- Data Quality Indicator Report (AMP255)

3.3.3 Flow Rate Verifications

3.3.3.1 Background

Flow rate verification assessments are defined by 40 CFR Part 58 Appendix A Sections 3.2.3. 3.3.2 and 4.2.2. They are used to assess the precision and bias of flow measurements associated with PM samplers.

3.3.3.2 Input Transaction

Field No.	Field Name	Definition
1	Transaction Type	Literal string 'RP'
2	Action Indicator	Single character code to indicate whether to Insert, Update, or Delete data ('I', 'U', 'D')
3	State Code / Tribal Indicator	FIPS state code or tribal indicator – 'TT'
4	County Code / Tribal Code	FIPS County code or FIPS Tribal Code
5	Site ID	Four digit number to uniquely identify site in county.
6	Parameter	AQS code for physical quantity being measured by monitor.
7	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter; i.e. when there are more than one monitor for a parameter at a site, they must have different POCs.
8	Precision ID	Number (starting with 1) of the precision check for the day.
9	Duration Code	Duration code for sample measurement data for the monitor.
10	Reported Unit	Units of measure of the flow rate
11	Actual Method	AQS method code for the monitor.
12	Precision Date	Date precision check performed.
13	Actual Value	Flow rate reported by the flow meter used to check monitor.
14		Field not used
15	Indicated Value	Flow rate measured by monitor

3.3.3.3 AQS Outputs

Flow rate verifications are presently output by AQS by the following standard reports:

- Precision Report (AMP246)
- P&A Raw Data Report (AMP250)
- Data Quality Indicator Report (AMP255)

3.3.4 Semi-Annual Flow Rate Audits

3.3.4.1 Background

Semi-Annual Flow Rate Audits are defined by 40 CFR Part 58 Appendix A Sections 3.2.4, .3.3.3 and 4.2.3. They are used to assess the precision and bias of flow measurements associated with PM samplers

3.3.4.2 Input Transaction

Field No.	Field Name	Definition
1	Transaction Type	Literal string 'RA'
2	Action Indicator	Single character code to indicate whether to Insert, Update, or Delete data ('I', 'U', 'D')
3	State Code / Tribal Indicator	FIPS state code or tribal indicator – 'TT'
4	County Code / Tribal Code	FIPS County code or FIPS Tribal Code
5	Site ID	Four digit number to uniquely identify site in county.
6	Parameter	AQS code for physical quantity being measured by monitor.
7	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site; i.e. when there are more than one monitor for a parameter at a site, they must have different POCs.
8	Accuracy Audit ID Number	Number (starting with 1) to uniquely identify assessment for day.
9	Duration Code	Duration code for sample measurement data for the monitor.
10	Reported Unit	Units of measure of the flow rate.
11	Method Code	AQS method code for the monitor.
12		Field not used
13		Field not used
14	Accuracy Date	Date assessment performed
15	Audit Type	Field indicating whether the assessment was performed by the Reporting Organization or another agency.
16	Local Primary Standard	Name of standard method used for audit.
17	Audit Class	Literal String "FLOW"
18	Accuracy Type	Literal String "PE"

Field No.	Field Name	Definition
19		Field not used
20		Field not used
21		Field not used
22	First Actual Value	Flow rate reported by the flow meter used to check monitor
23	First Indicated Value	Flow rate measured by monitor

3.3.4.3 AQS Outputs

Semi-Annual Flow Audits are presently output by AQS by the following standard reports:

- Accuracy Report (AMP247)
- P&A Raw Data Report (AMP250)
- Data Quality Indicator Report (AMP255)

3.3.5 Collocated Assessments

3.3.5.1 Background

Collocated assessments for PM are defined by 40 CFR Part 58 Appendix A Sections 3.2.5 for PM2.5, 3.2.6 for PM 10-2.5, 3.3.1 for PM 10, and 3.3.4.3 for Lead. They are used to assess the precision and bias of concentration measurements associated with PM and Lead samplers.

Note: The collocated data is typically reported to AQS as Sample Measurements (RD transactions), but AQS also allows it to be reported via the RP transaction as indicated below.

3.3.5.2 Input Transaction

Field No.	Field Name	Definition
1	Transaction Type	Literal string ‘RP’
2	Action Indicator	Single character code to indicate whether to Insert, Update, or Delete data (‘I’, ‘U’, ‘D’)
3	State Code / Tribal Indicator	FIPS state code or tribal indicator – ‘TT’
4	County Code / Tribal Code	FIPS County code or FIPS Tribal Code
5	Site ID	Four digit number to uniquely identify site in county.
6	Parameter	AQS code for physical quantity being measured by monitor.
7	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter; i.e. when

Field No.	Field Name	Definition
		there are more than one monitor for a parameter at a site, they must have different POCs.
8	Precision ID	Number (starting with 1) of the precision check for the day.
9	Duration Code	Duration code for sample measurement data for the monitor.
10	Reported Unit	Units of measure of the concentration.
11	Actual Method	Primary Sampler Method
12	Precision Date	Date precision check performed.
13	Actual Value	Concentration measured by Primary Sampler.
14	Indicated Method	Method used by QA Collocated monitor.
15	Indicated Value	Concentration measured by QA Collocated monitor
16	Collocated POC	POC of QA Collocated Monitor (if present in AQS)

3.3.5.3 AQS Outputs

Collocated assessments are presently output by AQS by the following standard reports:

- Precision Report (AMP246)
- P&A Raw Data Report (AMP250)
- Data Quality Indicator Report (AMP255)

3.3.6 PEP Audits

3.3.6.1 Background

Collocated assessments for PM are defined by 40 CFR Part 58 Appendix A Sections 3.2.7 for PM2.5, 3.2.8 for PM 10-2.5, and 3.3.4.4 for Lead. They are used to assess bias of concentration measurements associated with PM and Lead samplers.

3.3.6.2 Input Transaction

Field No.	Field Name	Definition
1	Transaction Type	Literal string ‘RP’
2	Action Indicator	Single character code to indicate whether to Insert, Update, or Delete data (‘I’, ‘U’, ‘D’)
3	State Code / Tribal Indicator	FIPS state code or tribal indicator – ‘TT’

Field No.	Field Name	Definition
4	County Code / Tribal Code	FIPS County code or FIPS Tribal Code
5	Site ID	Four digit number to uniquely identify site in county.
6	Parameter	AQS code for physical quantity being measured by monitor.
7	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter; i.e. when there are more than one monitor for a parameter at a site, they must have different POCs.
8	Precision ID	Number (starting with 1) of the precision check for the day.
9	Duration Code	Duration code for sample measurement data for the monitor.
10	Reported Unit	Units of measure of the concentration.
11	Actual Method	Audit Sampler Method
12	Precision Date	Date precision check performed.
13	Actual Value	Concentration measured by Audit Sampler.
14		Field Not Used
15		Field Not Used
16		Field Not Used
17		Field Not Used.
18	Agency Performing FRM Audit	Independent agency performing audit/

3.3.6.3 AQS Outputs

PEP Audits are presently output by AQS by the following standard reports:

- Precision Report (AMP246)
- P&A Raw Data Report (AMP250)
- Data Quality Indicator Report (AMP255)

3.3.7 NPAP Audits

3.3.7.1 Background

The National Performance Audit Program is required by 40 CFR Part 58 Appendix A Section 2.4.

3.3.7.2 Input Transaction

Field No.	Field Name	Definition
1	Transaction Type	Literal string 'RA'
2	Action Indicator	Single character code to indicate whether to Insert, Update, or Delete data ('I', 'U', 'D')
3	State Code / Tribal Indicator	FIPS state code or tribal indicator – 'TT'
4	County Code / Tribal Code	FIPS County code or FIPS Tribal Code
5	Site ID	Four digit number to uniquely identify site in county.
6	Parameter	AQS code for physical quantity being measured by monitor.
7	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter; i.e. when there are more than one monitor for a parameter at a site, they must have different POCs.
8	Accuracy Audit ID Number	Number (starting with 1) to uniquely identify assessment for day.
9	Duration Code	Duration code for sample measurement data for the monitor.
10	Reported Unit	Units of measure of the concentration.
11	Method Code	AQS method code for the monitor.
12		Field not used
13		Field not used
14	Accuracy Date	Date assessment performed
15	Audit Type	Field indicating whether the assessment was performed by the Reporting Organization or another agency.
16	Local Primary Standard	Name of standard method used for audit.
17	Audit Class	Literal String "ANALYTICAL"
18	Accuracy Type	Either "NPAP-TTP" or "NPAP-BOA" for through-the-probe of back-of-analyzer respectively

Field No.	Field Name	Definition
19		Field not used
20		Field not used
21		Field not used
22	First Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
23	First Indicated Value	Concentration measured by monitor of check gas for level.
24	Second Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
25	Second Indicated Value	Concentration measured by monitor of check gas for level.
26	Third Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
27	Third Indicated Value	Concentration measured by monitor of check gas for level.
28	Fourth Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
29	Fourth Indicated Value	Concentration measured by monitor of check gas for level.
30	Fifth Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
31	Fifth Indicated Value	Concentration measured by monitor of check gas for level.

3.3.7.3 AQS Outputs

NPAP Audits are presently output by AQS by the following standard reports:

- Accuracy Report (AMP247)
- P&A Raw Data Report (AMP250)

3.3.8 Lead Analysis Audits

3.3.8.1 Background

Lead Analysis Audits are defined by 40 CFR Part 58 Appendix A Section 3.3.4.2 and 4.4.2.

Note: These audits are intended as a measure of the analytical lab, however, since AQS does not presently support data input by agency (lab) code, they are reported for a monitor for the PQAO that utilizes the analytical lab, where the specific monitor is selected arbitrarily.

3.3.8.2 Input Transaction

Field No.	Field Name	Definition
1	Transaction Type	Literal string 'RA'
2	Action Indicator	Single character code to indicate whether to Insert, Update, or Delete data ('I', 'U', 'D')
3	State Code / Tribal Indicator	FIPS state code or tribal indicator – 'TT'
4	County Code / Tribal Code	FIPS County code or FIPS Tribal Code
5	Site ID	Four digit number to uniquely identify site in county.
6	Parameter	AQS code for physical quantity being measured by monitor.
7	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter; i.e. when there are more than one monitor for a parameter at a site, they must have different POCs.
8	Accuracy Audit ID Number	Number (starting with 1) to uniquely identify assessment for day.
9	Duration Code	Duration code for sample measurement data for the monitor.
10	Reported Unit	Units of measure of the concentration.
11	Method Code	AQS method code for the monitor.
12	Year Represented	Year of samples (RD) being analyzed when lab performs Lead Analysis Audit.
13	Quarter Represented	Quarter of samples (RD) being analyzed when lab performs Lead Analysis Audit.
14	Accuracy Date	Date assessment performed
15	Audit Type	Field indicating whether the assessment was performed by the Reporting Organization or another agency.
16	Local Primary Standard	Name of standard method used for audit.

Field No.	Field Name	Definition
17	Audit Class	Literal String "ANALYTICAL"
18	Accuracy Type	Literal String "PE"
19		Field not used
20		Field not used
21		Field not used
22	First Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
23	First Indicated Value	Concentration measured by monitor of check gas for level.
24	Second Actual Value	Known concentration of audit gas from cylinder used to challenge monitor. This concentration must fall within one of the audit levels defined for the parameter.
25	Second Indicated Value	Concentration measured by monitor of check gas for level.

3.3.8.3 AQS Outputs

Lead Analysis Audits are presently output by AQS by the following standard reports:

- Accuracy Report (AMP247)
- P&A Raw Data Report (AMP250)
- Data Quality Indicator Report (AMP255)

3.3.9 Quality Management Plan

All monitoring organizations are required to submit a Quality Management Plan to the EPA by 40 CFR Part 58 Appendix A Section 2.1. However AQS does not presently support input or tracking of this document.

3.3.10 Quality Assurance Project Plan

All monitoring organizations are required to submit a Quality Assurance Project Plan to the EPA by 40 CFR Part 58 Appendix A Section 2.1. However AQS does not presently support input or tracking of this document.

3.4 Modes of Operation

The system operates in one of two modes – State or Tribal.

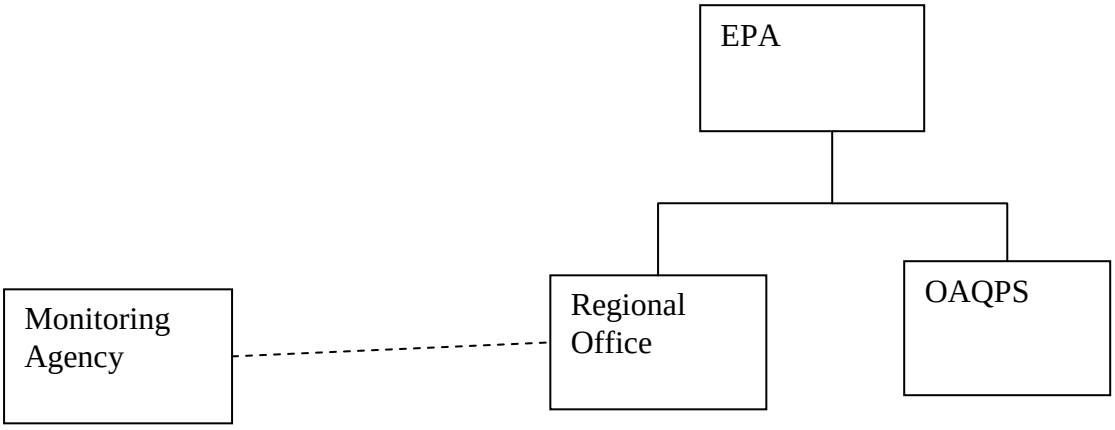
In State mode, all references to Sites are by the key (State-Code, County-Code, Site-Number)

In Tribal mode, references to Sites can be by either the key (Tribal-Code, Site Number) for all sites that are owned by a Tribe, and by the key (State-Code, County-Code, Site-Number) for sites that are not owned by a Tribe.

3.5 User Classes and Other Involved Personnel

3.5.1 Organizational Structure

The following diagram shows the organizational structure of the stakeholders:



3.5.2 Profiles of User Classes

3.5.2.1 Monitoring Agency Precision and Accuracy Submitter

The monitoring agency precision and accuracy submitters are the personnel at a monitoring agency with responsibilities, and AQS security permissions, to submit routine assessments to AQS. These include the following: 1-Point QC for gases, Annual performance evaluations for gases, flow rate verifications, semi-annual flow rate audits, collocated audits for PM and Lead.

Note: This may or may not be the same personnel who submit sample measurement data (raw data) to AQS.

3.5.2.2 Independent Auditor Submitter

An independent auditor is a staff member is an employee of a distinct agency, or an independent quality organization within the monitoring agency, who has been authorized to conduct independent audits of the monitoring program. These independent audits are PEP audits of PM and Lead, and NPAP audits.

3.5.2.3 Analysis Lab Submitter

In some cases, filter or canister based data is analyzed by a laboratory that is a different agency than the monitoring organization. In those cases, personnel from the lab may submit routine assessments to AQS.

3.5.2.4 EPA Reviewer

EPA reviewers are either Regional Office or EPA Headquarters personnel who review QA/QC assessment data for evaluating a monitoring agency's data quality.

3.5.3 Interactions Between User Classes

EPA Reviewers provide feedback to Monitoring Agency personnel about issues with the Monitoring Agency's monitoring program based on the QA/QC data in the AQS database.

3.5.4 Other Involved Personnel

Not Applicable.

3.6 Support Environment

The support environment for AQS is the EPA National Computer Center and the IT infrastructure that it provides. This consists of the following:

- An Oracle database for hosting the AQS data
- An Oracle Fusion Middleware (OFM) server for hosting the AQS application components (such as forms, reports, bulk load facilities, and web service components)
- The EPA Common Data Exchange to provide the interface between the EPA and submitting agencies.

All of these facilities are replicated to provide a production environment, a formal test (staging) environment, a disaster recovery environment, and a development environment.

4 Justification and Nature of Changes

4.1 Justification for Changes

1. The present AQS transactions and output reports only support seven of the 12 QA/QC assessments required by 40 CFR Part 58 Appendix A. The do not support any of the QA/QC assessments required by either the NATTS, CSN, or PAMS programs.

2. Because the two present input transactions are used to support multiple types of assessments, the fields on each transaction have different meanings based on the assessment type being submitted. As a result, usage of these transactions is confusing and error intensive for users.

4.2 Description of Desired Changes

1. Define the set of data elements associated with each assessment type that must be submitted to AQS and define the set of field names to be associated with each assessment type, where the field name clearly reflects the data element definition (from the regulatory or guidance documents requiring the assessment). The required assessment types are as follows:
    a. 1 Point QC for SO2, NO2, O3, CO
    b. Annual Performance Evaluation for SO2, NO2, O3, CO
    c. Flow Rate Verification
    d. Semi-Annual Flow Rate Audit
    e. Performance Evaluation Program (PEP) for PM2.5 and PM10-2.5
    f. Pb Analysis Audit
    g. National Performance Audit Program (NPAP)
    h. Pb PEP
    i. Collocated Pb PEP
    j. Field Proficiency Test
    k. Lab Proficiency Test
    l. Duplicate
    m. Replicate
    n. AA - PGVP (USEPA Ambient Air Protocol Gas Verification Program)
    o. Ozone SRP and Ozone Transfer Standard Verifications
    p. Technical Systems Audit (TSA)
    q. Audit of Data Quality
2. Design and develop AQS facilities to allow all of these assessments types to be loaded into AQS.
3. Design and develop AQs facilities to allow all of the QA assessment types to be interactively edited via a user friendly interface (i.e. maintain forms).
4. Enhance the Data Quality Indicator Report (AMP255) to calculate the statistics and present the results for each of the Appendix A assessments not presently supported.

5. Design and develop output reports to display the raw assessment information in a formatted report for all assessment types (analogous to the outputs presently provided by AMP250, AMP246, and AMP247).
6. Design and develop the AQS facilities to extract all assessment types from AQS in the same format that they were submitted (analogous to AMP502).
7. Design and develop AQS facilities to convert existing data from Precision and Accuracy database objects to the new database objects defined for this project and to convert data submitted via the existing Precision and accuracy transaction to the new tables.

4.3 Priorities Among Changes

1. The highest priority among the changes is the creation of the facilities needed for Data Certification. This is anticipated to involve the following:
    a. Migrating existing Precision and Accuracy data to the new set of tables defined by this project
    b. Creation of the software components required to calculate the QA completeness, Precision, and Bias presently reported by the Data Quality Indicator Report (AMP255) that are also required by the Data Certification Report.
2. The second highest priority changes are those needed to fully support the requirements of 40 CFR Part 58 Appendix A.
3. The lowest priority changes are those not associated with Appendix A requirements.

4.4 Changes Considered but Not Included

1. Explicitly mapping the definition of a monitor in AQS to a real-world instrument would be of significant benefit to both the QA process and other AQS processes, however, it is likely that implementing this capability as part of this project would significantly increase the risk of not completing the required capabilities by the milestone dates needed.
2. Implementing the capability to actually upload documents such as the Annual Network Monitoring Plan, the Quality Management Plan, and the Quality Assurance Project Plan into AQS, would improve the EPA's ability to track the submissions and approvals of these documents. However, this also would increase risk by increasing the scope of this project.

4.5 Assumptions and Constraints

None.

5 Proposed System Concept

5.1 Background, Objectives, and Scope

5.1.1 Background

As noted in the System Overview, AQS is the primary EPA repository for ambient air quality monitoring information. This includes 1) the measurement data itself, 2) the metadata for the sites (locations) where measurements are taken and the monitoring equipment utilized to collect and analyze samples, and 3) the QA/QC information for the monitoring process.

5.1.2 Objectives

1. Enhance AQS to support loading of all of the QA/QC assessment types defined by 40 CFR Part 58 Appendix A, the NATTS Technical Assistance Document, the CSN program, and eventually the PAMS program.
2. Enhance AQS to support the tracking of the required Quality Management Plan and Quality Assurance Project Plan documents.
3. Enhance AQS to support calculation and reporting (output) of all of the QA/QC statistical results required by 40 CFR Part 58 Appendix A, in such a way that they can be utilized both for reporting monitoring program quality (via the Data Quality Indicator Report) and for the Data Certification process.

5.1.3 Scope

1. Define the set of data elements associated with each assessment type that must be submitted to AQS, where the field name clearly reflects the data element definition (from the regulatory or guidance documents requiring the assessment).
2. Design and develop AQS facilities to allow all of these assessments types (transaction types) to be loaded into AQS.
3. Design and develop AQS facilities to allow all of the QA assessment types to be interactively edited via a user friendly interface (i.e. maintain forms).
4. Enhance the Data Quality Indicator Report (AMP255) to calculate the statistics and present the results for each of the Appendix A assessments not presently supported.
5. Design and develop output reports to display the raw assessment information in a formatted report for all assessment types (analogous to the outputs presently provided by AMP250, AMP246, and AMP247).
6. Design and develop the AQS facilities to extract all assessment types from AQS in the same format that they were submitted (analogous to AMP502).
7. Design and develop AQS facilities to convert existing data from Precision and Accuracy database objects to the new database objects defined for this project and to convert data submitted via the existing Precision and accuracy transaction to the new tables.

5.2 Operational Policies and Constraints

1. 40 CFR Part 58 Appendix A, Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)
2. Technical Assistance Document for the National Air Toxics Trends Stations Program Revision 2 (NATTS TAD) April 1, 2009
3. QA Handbook for Air Pollution Measurement Systems: Volume II: Ambient Air Quality Monitoring Program EPA-454/B-08-003, December 2008

5.3 Description of the Proposed System

5.3.1 Assessments Required by 40 CFR Part 58 Appendix A

5.3.1.1 1-Point QC Assessments

Regulatory Requirement

40 CFR Part 58 Appendix A §3.2.1 regulations require the PQAO to perform a quality control check at least once every 2 weeks at required ranges (0.01 – 0.1ppm for SO2, NO2 and O3; and 1 – 10 ppm for CO) on every automated gaseous monitor.

Description of Assessment

The monitors for which this assessment applies usually sample continuously and report hourly average values as raw data to AQS. When it is time to run the 1-Point QC assessment, the check standard is introduced in the monitor, and readings from the monitor recorded. The monitor concentration and the check standard concentration are reported to AQS for the monitor and date. The "check standard" is a gas concentration generated from standard reference materials. In the case of O3, the "check standard" concentration is generated using an ozone generator.

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type "QA"
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	Assessment Type	A label specifying the assessment for which data is being submitted. "1-Point QC"
4	Performing Agency Code	Agency Code of organization performing assessment
5	State Code / Tribal Indicator	The FIPS state code of the monitor being assessed, or "TT" to indicate that the next field on the transaction is a Tribal code.
6	County Code / Tribal Code	The FIPS County Code of the monitor being assessed. If the previous field on the transaction contains "TT", then the Tribal Code of the monitor being assessed.
7	Site number	Four digit number to uniquely identify site in county.
8	Parameter Code	The AQS parameter code assigned to the monitor in AQS for which the assessment is being performed

Field No.	Proposed Field Name	Description
9	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site.
10	Assessment Date	Date that the assessment was performed
11	Assessment Number	A unique number associated with an assessment performed at a site on a given day. Value should be "1" unless additional same assessments are performed.
12	Monitor Method Code	The sampling methodology of the monitor being assessed.
13	Reported Unit	Units associated with the assessment concentrations (Monitor Concentration and Check Standard Concentration)
14	Monitor Concentration	The concentration value provided by the monitor being assessed.
15	Assessment Concentration	The value of the known gas standard concentration.

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.
- Data Quality Indicator Report (AMP255): For this assessment, the contents of AMP255 are not modified, only the sources (internal database tables) from which the information is derived.

5.3.1.2 Annual Performance Evaluation Assessments

Regulatory Requirement

40 CFR Part 58 Appendix A §3.2.2 regulations require the PQAO, each calendar quarter (during which monitors are operated), evaluate at least 25 percent of the SLAMS monitors that monitor for SO_2, NO_2, O_3, or CO such that each monitor is evaluated at least once per year.

Description of Assessment

The evaluation is made by challenging the monitor with audit gas standards of known concentration from at least three of ten audit levels. The audit levels selected should represent or bracket 80 percent of ambient concentrations measured by the monitor being evaluated.

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type "QA"
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	Assessment Type	A label specifying the assessment for which data is being submitted. "Annual PE"
4	Performing Agency Code	Agency Code of organization performing assessment
5	State Code / Tribal Indicator	The FIPS state code of the monitor being assessed, or "TT" to indicate that the next field on the transaction is a Tribal code.
6	County Code / Tribal Code	The FIPS County Code of the monitor being assessed. If the previous field on the transaction contains "TT", then the Tribal Code of the monitor being assessed.
7	Site number	Four digit number to uniquely identify site in county.
8	Parameter Code	The AQS parameter code assigned to the monitor in AQS for which the assessment is being performed
9	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site.
10	Assessment Date	Date that the assessment was performed
11	Assessment Number	A unique number associated with an assessment performed at a site on a given day. Value should be "1" unless additional same assessments are performed.
12	Monitor Method Code	The sampling methodology of the monitor being assessed.
13	Reported Unit	Units associated with the assessment concentration (Monitor Concentration and Standard Concentration
14	Level 1 Monitor Concentration	The concentration value provided by the monitor being assessed.
15	Level 1 Assessment Concentration	The value of the known gas standard concentration in Audit Level 1.
16	Level 2 Monitor Concentration	The concentration value provided by the monitor being assessed.
17	Level 2 Assessment Concentration	The value of the known gas standard concentration in Audit Level 2.
18	Level 3 Monitor Concentration	The concentration value provided by the monitor being assessed.
19	Level 3 Assessment Concentration	The value of the known gas standard concentration in Audit Level 3.
20	Level 4 Monitor Concentration	The concentration value provided by the monitor being assessed.
21	Level 4 Assessment Concentration	The value of the known gas standard concentration in Audit Level 4.
22	Level 5 Monitor Concentration	The concentration value provided by the monitor being assessed.

Field No.	Proposed Field Name	Description
23	Level 5 Assessment Concentration	The value of the known gas standard concentration in Audit Level 5.
24	Level 6 Monitor Concentration	The concentration value provided by the monitor being assessed.
25	Level 6 Assessment Concentration	The value of the known gas standard concentration in Audit Level 6.
26	Level 7 Monitor Concentration	The concentration value provided by the monitor being assessed.
27	Level 7 Assessment Concentration	The value of the known gas standard concentration in Audit Level 7.
28	Level 8 Monitor Concentration	The concentration value provided by the monitor being assessed.
29	Level 8 Assessment Concentration	The value of the known gas standard concentration in Audit Level 8.
30	Level 9 Monitor Concentration	The concentration value provided by the monitor being assessed.
31	Level 9 Assessment Concentration	The value of the known gas standard concentration in Audit Level 9.
32	Level 10 Monitor Concentration	The concentration value provided by the monitor being assessed.
33	Level 10 Assessment Concentration	The value of the known gas standard concentration in Audit Level 10.

Note: The Audit levels for the assessment are explicitly defined by the position of the monitor and standard concentrations on the transactions; e.g. the first pair is always mapped to audit level 1. Warnings shall be issued by AQS if the Assessment Concentration on the transaction is not in the range of concentrations allowed for the audit level.

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.
- Data Quality Indicator Report (AMP255): For this assessment, the contents of AMP255 are not modified, only the sources (internal database tables) from which the information is derived.

5.3.1.3 Flow Rate Verifications

Regulatory Requirement

40 CFR Part 58 Appendix A § 3.2.3, 3.3.2 and 3.3.4.1 describe requirements for a one-point flow rate verification check on automated and manual monitors used to measure PM_{10}, $PM_{10-2.5}$, $PM_{2.5}$ Pb (Pb-TSP and Pb-PM_{10}).

Description of Assessment

To perform the flow rate verification check, the monitor's normal flow rate is checked using a certified flow rate transfer standard. The known flow rate of the transfer standard, and the measured (or indicated) value from the monitor, are recorded by the operator for entry into AQS for that monitor on that date.

This check is performed at different frequencies depending on the type of monitor being used. For manual method hi-vol samplers, flow rates must be verified on at least a quarterly basis. For manual method lo-vol samplers, flow rates must be verified on at least a monthly basis. For automated methods, flow rates must also be verified monthly.

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type "QA"
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	Assessment Type	A label specifying the assessment for which data is being submitted. "Flow Rate Verification"
4	Performing Agency Code	Agency Code of organization performing assessment
5	State Code / Tribal Indicator	The FIPS state code of the monitor being assessed, or "TT" to indicate that the next field on the transaction is a Tribal code.
6	County Code / Tribal Code	The FIPS County Code of the monitor being assessed. If the previous field on the transaction contains "TT", then the Tribal Code of the monitor being assessed.
7	Site number	Four digit number to uniquely identify site in county.
8	Parameter Code	The AQS parameter code assigned to the monitor in AQS for which the assessment is being performed
9	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site.
10	Assessment Date	Date that the assessment was performed
11	Assessment Number	A unique number associated with an assessment performed at a site on a given day. Value should be "1" unless additional same assessments are performed.
12	Monitor Method Code	The sampling methodology of the monitor being assessed at the time of assessment.
13	Reported Unit	Units associated with the assessment values (monitor flow rate and flow rate transfer

14	Monitor Flow Rate	The measured flow rate provided by the monitors being assessed.
15	Assessment Flow Rate	The flow rate of the flow transfer standard.

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.
- Data Quality Indicator Report (AMP255): For this assessment, the contents of AMP255 are not modified, only the sources (internal database tables) from which the information is derived.

5.3.1.4 Semi-Annual Flow Rate Audits

Regulatory Requirement

40 CFR Part 58 Appendix A § 3.2.4, 3.3.3, 3.3.4 and 3.3.4.1 describe requirements for flow rate audits to be performed on each monitor used to measure PM_{10}, $PM_{10\text{-}2.5}$, $PM_{2.5}$ and Pb. The Semi-Annual Flow Rate Audits should be performed at least every 6 months.

Description of Assessment

To perform the audit, the monitor's normal flow rate is checked using a certified flow rate transfer standard which is different from the one used for calibrating the monitor. The flow standard value (known flow rate of the transfer standard), and the monitor value (response value indicated by monitor) are recorded by the operator for entry into AQS for the monitor being assessed, for that date.

The auditing agency conducting the Semi-Annual Flow Rate Audit may be the PQAO, or may be an independent agency. In any event, the assessment should be conducted by other than the routine site operator.

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type "QA"
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	Assessment Type	A label specifying the assessment for which data is being submitted. "Semi-Annual Flow Rate Audit"
4	Performing Agency Code	Agency Code of organization performing assessment

Field No.	Proposed Field Name	Description
5	State Code / Tribal Indicator	The FIPS state code of the monitor being assessed, or "TT" to indicate that the next field on the transaction is a Tribal code.
6	County Code / Tribal Code	The FIPS County Code of the monitor being assessed. If the previous field on the transaction contains "TT", then the Tribal Code of the monitor being assessed.
7	Site number	Four digit number to uniquely identify site in county.
8	Parameter Code	The AQS parameter code assigned to the monitor in AQS for which the assessment is being performed
9	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site.
10	Assessment Date	Date that the assessment was performed
11	Assessment Number	A unique number associated with an assessment performed at a site on a given day. Value should be "1" unless additional same assessments are performed.
12	Monitor Method Code	The sampling methodology of the monitor being assessed
13	Reported Unit	Units associated with the assessment values (monitor flow rate and flow rate transfer
14	Monitor Flow Rate	The measured flow rate provided by the monitors being assessed.
15	Assessment Flow Rate	The flow rate of the flow transfer standard.

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.
- Data Quality Indicator Report (AMP255): For this assessment, the contents of AMP255 are not modified, only the sources (internal database tables) from which the information is derived.

5.3.1.5 Collocated Assessments

Regulatory Requirement

Collocated assessments for PM are defined by 40 CFR Part 58 Appendix A Sections 3.2.5 for PM2.5, 3.2.6 for PM 10-2.5, 3.3.1 for PM 10, and 3.3.4.3 for Lead. They are used to assess the precision and bias of concentration measurements associated with PM and Lead samplers.

Description of Assessment

The assessment involves comparison of the measured ambient air concentration at a specific location (site) and date/time by two monitors. The first monitor is designated as the "Primary" monitor, and is the one used for submitting routine sample measurements to be used for NAAQS determinations. The second monitor is designated as the "QA Collocated" monitor. 40 CFR Part 58 Appendix A requires that at least 15% of the sites monitoring for PM or Lead must be collocated with a second monitor (the QA Collocated monitor). For some pollutants, the 15% requirement is by method designation.

To perform the assessment, AQS compares the two submitted values and calculates the required statistics. The specific monitors to be used are designated via the Monitor Collocation process described later in this document.

AQS Input of Assessment

There is no requirement for a new transaction for this assessment, since the data is derived from the submitted Raw Data.

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.
- Data Quality Indicator Report (AMP255): For this assessment, the contents of AMP255 are not modified, only the sources (internal database tables) from which the information is derived.

5.3.1.6 PEP Audits

Regulatory Requirement

40 CFR Part 58 Appendix A § 3.2.7, and 3.3.7 for PM 2.5, Sections 3.2.8 and 3.3.8 for $PM_{10-2.5}$, and Section 3.3.4.4 for Lead describes requirements for performance evaluation (PE) sampling to be performed on automated and manual monitors used to measure bias for $PM_{2.5}$, $PM_{10-2.5}$, and Lead.

Description of Assessment

PEP assessments consist of a comparison of the S/L/T agency (PQAO's) primary monitor with a collocated, EPA FRM monitor which is brought on site and operated by EPA or a representative, with the filters sent to an EPA lab for analysis. In a few cases, the authority to perform PEP audits has been delegated to a "self-implementing" agency (a State Agency). At present, 4 states have delegated authority to run this program; they are CARB, TX, FL, NY. Note, for Lead, section 3.3.4.4 includes the use of a collocated monitor provided by the monitoring agency, as well as well as the implementation of an independent monitor, but the filters are sent to the EPA lab for analysis.

AQS Input of Assessment

Data flow from PQAO's monitor: The concentration from the PQAO's monitor for the date/time is submitted to AQS as routine sample measurement data (RD transaction).

The concentration for the PEP program monitor is submitted via the following transaction format:

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type "QA".
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	Assessment Type -	A label specifying the assessment for which data is being submitted. "PEP"
4	Performing Agency Code	Agency Code of organization performing assessment (in this case the PEP audit); i.e.
5	State Code / Tribal Indicator	The FIPS state code of the monitor being assessed, or "TT" to indicate that the next field on the transaction is a Tribal code.
6	County Code / Tribal Code	The FIPS County Code of the monitor being assessed. If the previous field on the transaction contains "TT", then the Tribal Code of the monitor being assessed.
7	Site number	Four digit number to uniquely identify site in county.
8	Parameter Code	The AQS parameter code assigned to the monitor in AQS for which the assessment is being performed
9	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site.
10	Assessment Date	Date that the assessment was performed
11	Assessment Number	A unique number associated with an assessment performed at a site on a given day. Value should be "1" unless additional same assessments are performed.
12	PEP Sampler	"INDEPENDENT" or "COLLOCATED"
13	PEP Monitor Method Code	Method code of the PEP monitor
14	Reported Unit	Units associated with the assessment values
15	PEP Concentration	The concentration provided by the PEP monitor.

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.

- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.
- Data Quality Indicator Report (AMP255): For this assessment, the contents of AMP255 are not modified, only the sources (internal database tables) from which the information is derived.

5.3.1.7 NPAP Audits

Regulatory Requirement

40 CFR Part 58 Appendix A § 2.4 describes requirements for the National Performance Evaluation Programs including a description of the National Performance Audit Program.

Description of Assessment

The NPAP assessment is an independent audit of the PQAO's gaseous monitors, performed by USEPA. In a few cases, the authority to perform the NPAP audits has been delegated to a "self-implementing" agency (a State Agency). In this case, the State will be allowed to enter annual performance evaluations representing NPAP audits. Otherwise, the PQAO cannot be the NPAP auditing agency.

20% of the PQAO's monitors must be audited each year, resulting in complete network coverage every 5 years. Mobile auditing labs or equipment travel to the monitor sites and perform the assessment.

The audit is performed by challenging the gaseous monitors with known, independent standards. These standards are either introduced at the inlet of the sampling probe (referred to as through the probe), or directly into the monitor (referred to as back of analyzer) when it is difficult to introduce the standard at the inlet of the probe due to logistical concerns. Depending on how the standard is introduced to the monitor, the audit is referred to as either an NPAP – TTP, or NPAP – BOA.

Audits are conducted at various concentration levels. These levels are achieved by diluting the multi blend cylinder gases to the desired concentration levels. The diluted gas is analyzed with a certified USEPA CO analyzer to check that the correct CO concentration is achieved. The other gas concentrations are then assumed to be proportionally correct. The S/L/T monitors are then audited using the diluted standard gas at three or more concentration levels.

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type "QA".
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	Assessment Type	A label specifying the assessment for which data is being submitted. "NPAP"

Field No.	Proposed Field Name	Description
4	Performing Agency Code	Agency Code of organization performing assessment
5	State Code / Tribal Indicator	The FIPS state code of the monitor being assessed, or "TT" to indicate that the next field on the transaction is a Tribal code.
6	County Code / Tribal Code	The FIPS County Code of the monitor being assessed. If the previous field on the transaction contains "TT", then the Tribal Code of the monitor being assessed.
7	Site number	Four digit number to uniquely identify site in county.
8	Parameter Code	The AQS parameter code assigned to the monitor in AQS for which the assessment is being performed
9	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site.
10	Assessment Date	Date that the assessment was performed
11	Assessment Number	A unique number associated with an assessment performed at a site on a given day. Value should be "1" unless additional same assessments are performed.
12	Monitor Method Code	The sampling methodology of the monitor being assessed.
13	NPAP Method Code	Method code of the certified USEPA CO analyzer
14	Reported Unit	Units associated with the assessment concentration (Monitor Concentration and Standard Concentration)
15	NPAP TYPE	"TTP" for Through The Probe, or "BOA" for Back Of Analyzer
16	Level 1 Monitor Concentration	The concentration value provided by the monitor being assessed.
17	Level 1 Assessment Concentration	The value of the known gas standard concentration in Audit Level 1.
18	Level 2 Monitor Concentration	The concentration value provided by the monitor being assessed.
19	Level 2 Assessment Concentration	The value of the known gas standard concentration in Audit Level 2.
20	Level 3 Monitor Concentration	The concentration value provided by the monitor being assessed.
21	Level 3 Assessment Concentration	The value of the known gas standard concentration in Audit Level 3.
22	Level 4 Monitor Concentration	The concentration value provided by the monitor being assessed.

Field No.	Proposed Field Name	Description
23	Level 4 Assessment Concentration	The value of the known gas standard concentration in Audit Level 4.
24	Level 5 Monitor Concentration	The concentration value provided by the monitor being assessed.
25	Level 5 Assessment Concentration	The value of the known gas standard concentration in Audit Level 5.
26	Level 6 Monitor Concentration	The concentration value provided by the monitor being assessed.
27	Level 6 Assessment Concentration	The value of the known gas standard concentration in Audit Level 6.
28	Level 7 Monitor Concentration	The concentration value provided by the monitor being assessed.
29	Level 7 Assessment Concentration	The value of the known gas standard concentration in Audit Level 7.
30	Level 8 Monitor Concentration	The concentration value provided by the monitor being assessed.
31	Level 8 Assessment Concentration	The value of the known gas standard concentration in Audit Level 8.
32	Level 9 Monitor Concentration	The concentration value provided by the monitor being assessed.
33	Level 9 Assessment Concentration	The value of the known gas standard concentration in Audit Level 6.
34	Level 10 Monitor Concentration	The concentration value provided by the monitor being assessed.
35	Level 10 Standard Concentration	The value of the known gas standard concentration in Audit Level 10.

Note: The Audit levels for the assessment are explicitly defined by the position of the monitor and standard concentrations on the transactions; e.g. the first pair is always mapped to audit level 1. Warnings shall be issued by AQS if the Standard Concentration on the transaction is not in the range of concentrations allowed for the audit level.

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.

Note: Results of NPAP assessments are not reported on the Data Quality Indicator Report.

5.3.1.8 Lead Analysis Audits

Regulatory Requirement

The information on the Pb analysis audit can be found in 40 CFR Part 58 Appendix A Section 3.3.4.2.

Three samples in each of 2 ranges are required every quarter, distributed over the quarter evenly. The ranges are defined as equivalent ambient Pb concentrations of:

Range	Equivalent ambient Pb concentration ($\mu g/m^3$)	Acceptable Levels
1	30 – 100% of Pb NAAQS	5.9 – 40 ug/strip**
2	200 – 300% of Pb NAAQS	41-123 ug/strip

**Acceptable audit levels based on recent assessment of various monitoring organizations.

Description of Assessment

Each laboratory analyzing Lead filters receives pairs of Lead strips that are prepared with known amount of Lead. The Pb strips can be supplied by OAQPS, or made by the PQAO's analyzing laboratory. Each strip has an appropriate mass of lead that falls within the above ranges.

The analyzing laboratory analyzes the strips and reports the mass to the PQAO (or reporting organization) for entry into AQS. The known mass, and the analyzing laboratory's determination of the mass, comprise each pair of values submitted on the transaction, and are used to calculate QA statistics.

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type "QA".
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	Assessment Type	A label specifying the assessment for which data is being submitted. "Pb Analysis Audit"
4	Performing Agency Code	Agency Code of organization performing assessment – in this case the lab agency
5	Primary Quality Assurance Organization	Agency code requesting the audit.
6	Parameter Code	AQS Parameter code assigned to Lead collected from a particular fraction of the airborne particles – 14129 for Lead TSP or 85129 for Lead PM10. (both at local conditions)
7	Assessment Date	Date assessment (analysis) was performed
8	Assessment Number	Allows multiple audits for same Assessment Type on the same day
9	Reported Unit	Units of assessment concentrations. Must be mass units.
10	Level 1 Lab response Value	Level 1 value measured by lab
11	Level 1 Known Mass	Level 1 known mass of lead on strip or filter.
12	Level 2 Lab response Value	Level 2 value measured by lab
13	Level 2 Known Mass	Level 2 known mass of lead on strip or filter.

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.
- Data Quality Indicator Report (AMP255): For this assessment, the contents of AMP255 are not modified, only the sources (internal database tables) from which the information is derived.

5.3.2 Other QA/QC Assessments (Not Addressed in Appendix A)

5.3.2.1 Field Proficiency Test

Regulatory Requirement

There is no regulatory requirement for Field Proficiency Test assessments. They are required by the NATTS Program

Description of Assessment

A proficiency test is a type of assessment in which a sample, the composition of which is unknown to the analyst, is provided to test whether the analyst/laboratory can produce analytical results within the specified acceptance criteria. VOCs and carbonyls are analyzed on site by analyzers. The proficiency test in this case is auditing the onsite analyzer. (This means that the monitor id is needed on the transaction to identify the analyzer being assessed.)

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type "QA".
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	Assessment Type	A label specifying the assessment for which data is being submitted. "Field PT"
4	Performing Agency Code	Agency Code of organization performing assessment
5	State Code / Tribal Indicator	The FIPS state code of the monitor being assessed, or "TT" to indicate that the next field on the transaction is a Tribal code.
6	County Code / Tribal Code	The FIPS County Code of the monitor being assessed. If the previous field on the transaction contains "TT", then the Tribal Code of the monitor being assessed.
7	Site number	Four digit number to uniquely identify site in county.
8	Parameter Code	The AQS parameter code assigned to the monitor in AQS for which the assessment is being performed
9	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site.
10	Assessment Date	Date assessment was performed
11	Assessment Number	Allows multiple audits for same Assessment Type on the same day
12	Monitor Method Code	Method code of the monitor being assessed
13	Reported Unit	Units associated with the assessment values
14	Monitor Value	Concentration reported by monitor
15	Assessment Value	Known concentration

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.

5.3.2.2 Lab Proficiency Test

Regulatory Requirement

There is no regulatory requirement for Field Proficiency Test assessments. They are required by the NATTS Program

Description of Assessment

A proficiency test is a type of assessment in which a sample, the composition of which is unknown to the analyst, is provided to test whether the analyst/laboratory can produce analytical results within the specified acceptance criteria. Metal analysis is performed by a laboratory off site. The proficiency test in this case is auditing the lab used to analyze the metals. For this case, the monitor id is not appropriate; rather the agency code of the lab is needed to identify the audited lab.

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type: "QA".
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	Assessment Type	A label specifying the assessment for which data is being submitted. "Lab PT"
4	Performing Agency Code	Agency Code of organization performing assessment – in this case the lab agency
5	Primary Quality Assurance Organization	Agency code requesting the audit.
6	Parameter Code	The AQS parameter code for which the assessment is being performed
7	Assessment Date	date assessment was performed
8	Assessment Number	Allows multiple audits for same Assessment Type on the same day
9	Reported Unit	Unit code associated with the assessment values
10	Lab Response Value	Mass of analyte reported by lab
11	Known Value	Known mass of analyte

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.

5.3.2.3 Duplicate

Regulatory Requirement

There is no regulatory requirement for Duplicate assessments. They are required by the NATTS Program.

Description of Assessment

Duplicate samples are samples collected simultaneously using one collection system (i.e., two separate samples through the same sampling system at the same time), and then analyzing the samples and comparing the results obtained. This simultaneous collection is typically accomplished by teeing the line from the flow control device to the canisters, and then doubling the collection flow rate. This approach provides information on "Intra-system" variability.

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type: "QA".
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	Assessment Type	A label specifying the assessment for which data is being submitted. "Duplicate"
4	Performing Agency Code	Agency Code of organization performing assessment
5	State Code / Tribal Indicator	The FIPS state code of the monitor being assessed, or "TT" to indicate that the next field on the transaction is a Tribal code.
6	County Code / Tribal Code	The FIPS County Code of the monitor being assessed. If the previous field on the transaction contains "TT", then the Tribal Code of the monitor being assessed.
7	Site number	Four digit number to uniquely identify site in county.
8	Parameter Code	The AQS parameter code assigned to the monitor in AQS for which the assessment is being performed
9	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site.
10	Assessment Date	Date that the assessment was performed
11	Assessment Number	A unique number associated with an assessment performed at a site on a given day. Value should be "1" unless additional same assessments are performed.
12	Monitor Method Code	Method code of the monitor being assessed

13	Reported Unit	Units associated with the assessment values
14	Duplicate Value 1	Analysis of first sample for assessment.
15	Duplicate Value 2	Analysis of second sample for assessment.
16	Duplicate Value 3	Analysis of third sample for assessment.
17	Duplicate Value 4	Analysis of fourth sample for assessment.
18	Duplicate Value 5	Analysis of fifth sample for assessment.

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.

5.3.2.4 Replicate

Regulatory Requirement

There is no regulatory requirement for Duplicate assessments. They are required by the NATTS Program.

Description of Assessment

Replicate analyses are the analysis of one discrete sample multiple times. These are also known as "split" sample analyses. This approach provides information on "Analytical" variability.

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type: "QA".
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	Assessment Type	A label specifying the assessment for which data is being submitted. "Replicate"
4	Performing Agency Code	Agency Code of organization performing assessment
5	State Code / Tribal Indicator	The FIPS state code of the monitor being assessed, or "TT" to indicate that the next field on the transaction is a Tribal code.
6	County Code / Tribal Code	The FIPS County Code of the monitor being assessed. If the previous field on the transaction contains "TT", then the Tribal Code of the monitor being assessed.
7	Site number	Four digit number to uniquely identify site in county.
8	Parameter Code	The AQS parameter code assigned to the monitor in AQS for which the assessment is being performed

9	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site.
10	Assessment Date	Date that the assessment was performed
11	Assessment Number	A unique number associated with an assessment performed at a site on a given day. Value should be "1" unless additional same assessments are performed.
12	Monitor Method Code	Method code of the monitor being assessed
13	Reported Unit	Units associated with the assessment values
14	Replicate Value 1	Analysis of first sample for assessment.
15	Replicate Value 2	Analysis of second sample for assessment.
16	Replicate Value 3	Analysis of third sample for assessment.
17	Replicate Value 4	Analysis of fourth sample for assessment.
18	Replicate Value 5	Analysis of fifth sample for assessment.

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.

5.3.3 Assessments of Gas Standards

5.3.3.1 AA - PGVP (USEPA Ambient Air Protocol Gas Verification Program)

Regulatory Requirement

40 CFR Part 58 Appendix A Section 2.6 specifies the following:

Gaseous and Flow Rate Audit Standards: Gaseous pollutant concentration standards (permeation devices or cylinders of compressed gas) used to obtain test concentrations for CO, SO2, NO, and NO2 must be traceable to either a National Institute of Standards and Technology (NIST) Traceable Reference Material (NTRM), NIST Standard Reference Materials (SRM) and Netherlands Measurement Institute (NMi) Primary Reference Materials (valid as covered by Joint Declaration of Equivalence) or a NIST-certified Gas Manufacturer's Internal Standard (GMIS), certified in accordance with one of the procedures given in reference 4 of this appendix. Vendors advertising certification with the procedures provided in reference 4 of this appendix and distributing gases as "EPA Protocol Gas" must participate in the EPA Protocol Gas Verification Program or not use "EPA" in any form of advertising.

Description of Assessment

The basic principles of the U.S. Environmental Protection Agency (EPA) *Traceability Protocol for the Assay and Certification of Gaseous Calibration Standards* (EPA, 1997) were developed

jointly by EPA, the National Bureau of Standards (now National Institute of Standards and Technology [NIST]).

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type: "QA".
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D).
3	Assessment Type	A label specifying the assessment for which data is being submitted. "AA-PGVP"
4	Performing Agency Code	Agency Code of organization performing assessment
5	Producer ID	ID code for producer
6	Cylinder ID	ID of the gas cylinder
7	Verification Laboratory	Code for the Regional Analytical Verification Laboratory.
8	Parameter Code	Parameter being audited
9	Assessment Date	Date assessment was performed
10	Assessment Number	A unique number associated with an assessment performed at a site on a given day. Value should be "1" unless additional same assessments are performed.
11	Reported Unit	Units associated with the assessment values
12	Producer Value	Reqd Producers Certified value
13	Assessment Value	Reqd Verification Lab value

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.

5.3.3.2 Ozone SRP and Ozone Transfer Standard Verifications

Regulatory Requirement

On February 8, 1979 (Federal Register, 44:8221-8233), the U.S. Environmental Protection Agency amended Appendix D of Title 40, Code of Federal Regulations (CFR), Part 50, to prescribe a calibration procedure for the calibration of reference methods for measuring ozone in the atmosphere.

Description of Assessment

In ambient air monitoring applications, precise ozone concentrations called standards are required for the calibration of ozone analyzers. Gaseous ozone standards cannot be stored for any practical length of time due to the reactivity and instability of the gas. Therefore, ozone concentrations must be generated and "verified" on site. When the monitor to be calibrated is located at a remote monitoring site, it is necessary to use a transfer standard that is traceable to a more authoritative standard. This document will identify the primary EPA standard reference photometers (SRPs) as Level 1 standards. Beyond the SRPs, all standards will be considered transfer standards and will be numbered (starting with 2) based on its "distance in the traceability chain" from a verification against a Level 1 standard.

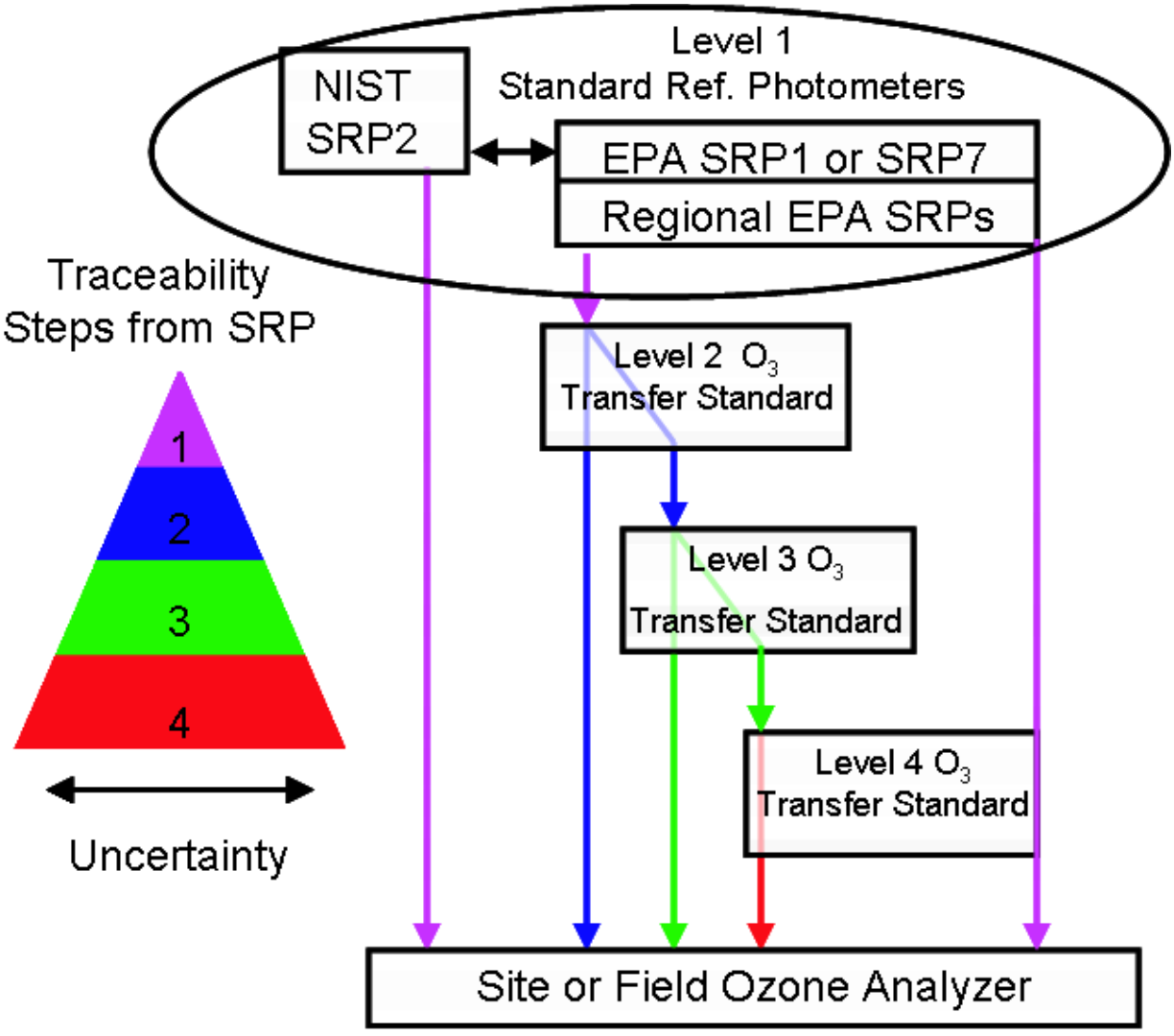


Figure 1.1. Ambient air ozone traceability scheme

The SRP comparison is accomplished by comparing a minimum of 7 replicate values of a zero point and a minimum of 6 upscale audit concentrations points. This 7 replicate 6 upscale

concentration test is considered a cycle. At a minimum, the SRP comparison will consist of three cycles (approximately 1 hour per cycle). For an acceptable comparison, the average slopes of the 7 replicates for each audit point must be within + 3% for all three cycles and + 3ppb at the 0 intercept. A new Level 2 standard or one that was adjusted or repaired would also be expected to undergo an initial 6x6 verification with an SRP. Verification requires the averaging of 6 comparisons between the transfer standard and a higher level UV O3 standard. Each comparison must cover the full range of O3 concentrations and is to be carried out on a different day to the higher level standard.

AQS Input of Assessment

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type: "QA".
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D).
3	Assessment Type	A label specifying the assessment for which data is being submitted. "AA-PGVP".
4	Verification Type	"6X6" or Standard
5	Performing Agency Code	Agency Code of organization performing assessment
6	Primary Quality Assurance Organization	PQAO of the owner of the instrument being assessed.
7	Parameter Code	Parameter that lab is being audited for "44201"
8	Authoritative standard ID	Unique ID code (serial number) for Authoritative standard.
9	Authoritative Standard Level	Level 1,2, or 3
10	Transfer standard ID	Unique ID code (serial number) for transfer standard
11	Transfer Standard Level	Level 1, 2, 3, 4 transfer standard has to be equal or a higher number then the Authoritative Standard
12	Assessment Date	Date assessment was performed
13	Assessment Number	Generic name for each QA transaction type (Assessment Type) Allows multiple audits for same Assessment Type on the same day
14	Reported Unit	Units associated with the assessment values
15	Transfer Standard Value 1	Measurement from instrument being assessed.
16	Authoritative Standard Value1	Measurement from authoritative standard instrument.
17	Transfer Standard Value 2	Measurement from instrument being assessed.
18	Authoritative Standard Value2	Measurement from authoritative standard instrument.
19	Transfer Standard Value 3	Measurement from instrument being assessed.
20	Authoritative Standard Value 3	Measurement from authoritative standard instrument.
21	Transfer Standard Value 4	Measurement from instrument being assessed.
22	Authoritative Standard Value 4	Measurement from authoritative standard instrument.
23	Transfer Standard Value 5	Measurement from instrument being assessed.
24	Authoritative Standard Value 5	Measurement from authoritative standard instrument.
25	Transfer Standard Value 6	Measurement from instrument being assessed.
26	Authoritative Standard Value 6	Measurement from authoritative standard instrument.
27	Transfer Standard Value 7	Measurement from instrument being assessed.

28	Authoritative Standard Value 7	Measurement from authoritative standard instrument.
29	Transfer Standard Value 8	Measurement from instrument being assessed.
30	Authoritative Standard Value 8	Measurement from authoritative standard instrument.
31	Transfer Standard Value 9	Measurement from instrument being assessed.
32	Authoritative Standard Value 9	Measurement from authoritative standard instrument.
33	Transfer Standard Value 10	Measurement from instrument being assessed.
34	Authoritative Standard Value 10	Measurement from authoritative standard instrument.

AQS Outputs

AQS shall provide the following output facilities for the data for this assessment:

- Raw QA Data Report: Formatted report (PDF) displaying the assessment data for each monitor and date selected. This shall include the percent difference for each assessment.
- QA Data Extraction: Enhancement to the existing AMP502 (Extract P&A Data) component to output the data for this assessment as it was loaded, in either AQS delimited format or XML.

5.3.4 QA/QC Metadata

This project shall include enhancements to AQS for the purpose of tracking metadata associated with the monitoring quality assurance process. This metadata shall be maintained via a set of on-line maintain forms.

5.3.4.1 Quality Management Plan

Regulatory Requirement

40 CFR Part 58 Appendix A § 2.1.1 provides requirements for the submission of Quality Management Plans (QMP).

Description

The QMP describes the quality system in terms of the organizational structure, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, assessing and reporting activities involving environmental data operations (EDO). The QMP must be approved by the appropriate Regional Administrator, or his or her representative. Organizations that implement long-term monitoring programs with EPA funds should have a separate QMP document. Smaller organizations or organizations that do infrequent work with EPA funds may combine the QMP with the Quality Assurance Project Plan (QAPP) based on negotiations with the funding agency.

Metadata Fields

Proposed Field Name	Description
Submitting Agency	AQS code of Agency submitting QMP.
Submission Date	Date QMP Received by approving agency.
Approval Date	Date QMP approved by approving agency.

5.3.4.2 Quality Assurance Project Plan

Regulatory Requirement

40 CFR Part 58 Appendix A § 2.1.2 provides requirements for submission of Quality Assurance Project Plans.

Description

The QAPP is a formal document describing, in sufficient detail, the quality system that must be implemented to ensure that the results of work performed will satisfy the stated objectives. QAPPs are parameter specific.

Note: In specific cases, the EPA may delegate the authority to approve QAPPS to an independent QA organization within a PQAO.

Metadata Fields

Proposed Field Name	Description
Submitting Agency	AQS code of agency submitting QAPP.
Approving Agency	AQS code of agency authorized to approve QAPP.
Parameter Code	AQS Parameter addressed by QAPP.
Submission Date	Date QAPP Received by approving agency.
Approval Date	Date QAPP approved by approving agency.

5.3.4.3 Technical Systems Audit (TSA)

Regulatory Requirement

40 CFR Part 58 Appendix A require EPA Regions to perform a TSA on monitoring organizations every 3 years. Systems audit programs are described in the QA Handbook volume 2.

Description

The technical systems audit, a qualitative on-site evaluation of an entire measurement system, is used frequently in an air monitoring program. It looks at everything - all facilities, equipment, systems, record keeping, data validation, operations, maintenance, calibration procedures, reporting requirements, and QC procedures. Findings from this global review can then be used to focus efforts on specific parts of the measurement system that need attention to obtain the desired data quality. Systems audits are normally done immediately before, or shortly after, measurement systems are operational, and should also be performed on a regularly scheduled basis throughout the lifetime of the project. Reporting of TSAs is simply a report of the date the TSA was implemented

Metadata Fields

Proposed Field Name	Description
Performing Agency	Agency Code of organization performing the TSA.
Monitoring Agency	Agency Code of audited organization

Assessment Begin Date	Date assessment began
Assessment End Date	Date assessment completed
Closeout Date	Date all corrective action (if any) was completed. This date could be the same as the Assessment End Date if no corrective action was required

5.3.4.4 Audit of Data Quality

Regulatory Requirement

There is no regulatory requirement for Audit of Data Quality assessments.

Description of Assessment

An audit of data quality is a qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality. The following criteria are evaluated against the QA project plan and other pertinent guidelines:

- Recording and transfer of raw data
- Calculations, including equations used for presentation of data
- Documentation of data-handling procedures
- Selection and discussion of data-quality indicators, including precision, sensitivity (detectability) accuracy, representativeness, comparability, and completeness

Metadata Fields

Proposed Field Name	Description
Performing Agency Code	Agency Code of organization performing the assessment.
Monitoring Agency	Agency Code of audited organization
Assessment Begin Date	Date assessment began
Assessment End Date	Date assessment completed
Closeout Date	Date all corrective action (if any) was completed. This date could be the same as the Assessment End Date if no corrective action was required

5.3.5 New AQS Monitor Metadata

5.3.5.1 Monitor Method

Description

Historically, AQS has not maintained information relating a monitor to the sampling methodology (method of collection and method of analysis) associated with that monitor, even though 40 CFR Part 58 Appendix A describes monitors as implementing specific methods. Furthermore, not associating method codes with AQS monitors causes significant performance problems for reporting summary data. It has been decided to track this association in AQS.

Transaction Fields

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type: “MM”.

2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	State Code / Tribal Indicator	The FIPS state code of the monitor being assessed, or "TT" to indicate that the next field on the transaction is a Tribal code.
4	County Code / Tribal Code	The FIPS County Code of the monitor being assessed. If the previous field on the transaction contains "TT", then the Tribal Code of the monitor being assessed.
5	Site number	Four digit number to uniquely identify site in county.
6	Parameter Code	The AQS parameter code assigned to the monitor in AQS for which the assessment is being performed
7	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site.
8	Monitor Method Code	AQS Method code associated with the monitor.
9	Begin Date	Units associated with the assessment values
10	End Date	Analysis of first sample for assessment.

5.3.5.2 Monitor Network Affiliation

Description

Historically, AQS has recorded the monitoring network as a Monitor Type. It has been decided by OAQPS to store this information in a separate field – Network Affiliation.

Transaction Fields

Field No.	Proposed Field Name	Description
1	Transaction Type	New transaction type: "MN".
2	Action Indicator	1 character code specifying Insert (I), Update (U) or Delete (D)
3	State Code / Tribal Indicator	The FIPS state code of the monitor being assessed, or "TT" to indicate that the next field on the transaction is a Tribal code.
4	County Code / Tribal Code	The FIPS County Code of the monitor being assessed. If the previous field on the transaction contains "TT", then the Tribal Code of the monitor being assessed.
5	Site number	Four digit number to uniquely identify site in county.
6	Parameter Code	The AQS parameter code assigned to the monitor in AQS for which the assessment is being performed
7	POC	Parameter Occurrence Code: One or two digit number identifying a specific monitor for a parameter at the site.
8	Network Affiliation	AQS code for monitoring network (e.g. 'NCORE')
9	Begin Date	First date monitor associated with network.
10	End Date	Last date monitor associated with network.

5.3.6 Report Outputs

5.3.6.1 QA Raw Data Report

The QA Raw Data Report replaces the following set of reports:

- AMP246 Precision Report
- AMP247 Accuracy Report
- AMP250 P&A Raw Data Report

This report combines the data from all of the above into a single report structure.

Report Structure

1. At the top level, the report is organized by Assessment Type (e.g. 1-Point QC, Annual Performance Evaluation, & etc.) Each assessment type will have a report format specific to that assessment type.
2. The second level of the report is PQAO. The report shall page break on PQAO.
3. The third level of the report is parameter. The report shall page break on parameter. Where Appendix A describes statistics aggregated by PQAO and Parameter, these shall be presented by the report.
4. The fourth level of the report (where appropriate) is method. Data shall be segregated by breaks in method. Where Appendix A describes statistics aggregated by method, these shall be presented by the report.
5. The fifth level of the report is site-monitor (were appropriate for assessment type). Data shall be segregated by site-monitor.
6. The sixth level of the report is date, and the seventh is assessment number. For each combination of these, all of the individual assessment information shall be presented along with the percent difference.

5.3.6.2 Data Quality Indicator Report

The Data Quality Indicator Report purpose remains unchanged; it provides all of the Appendix A statistics for evaluating monitoring program quality.

5.3.6.3 Extract QA Data

The Extract QA Data "report" corresponds to the Extract P&A Data "report" (AMP502). It will extract the data in either delimited or XML transaction format.

5.4 Modes of Operation

The system operates in one of two modes – State or Tribal.

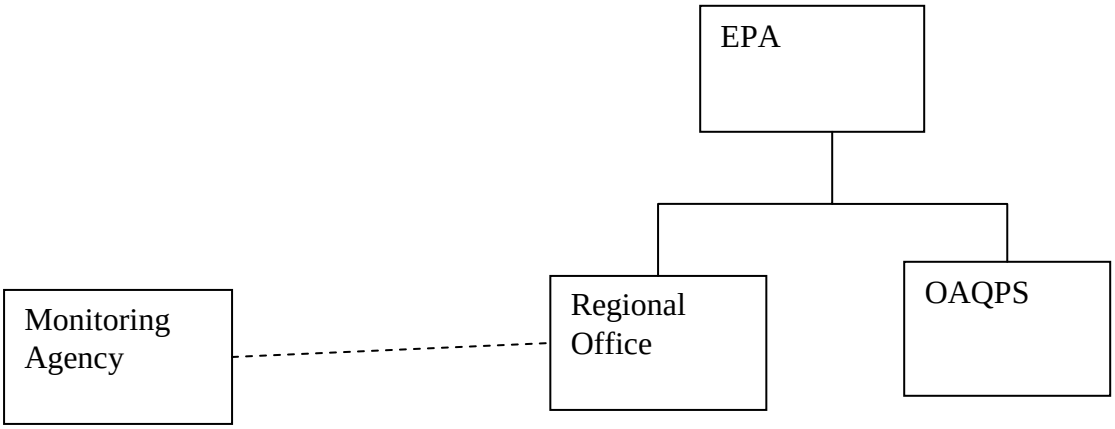
In State mode, all references to Sites are by the key (State-Code, County-Code, Site-Number)

In Tribal mode, references to Sites can be by either the key (Tribal-Code, Site Number) for all sites that are owned by a Tribe, and by the key (State-Code, County-Code, Site-Number) for sites that are not owned by a Tribe.

5.5 User Classes and Other Involved Personnel

5.5.1 Organizational Structure

The following diagram shows the organizational structure of the stakeholders:



5.5.2 Profiles of User Classes

With the proposed change, there are two aspects of user classes. The first is Agency Role and the second is User Permissions. Agency Roles relate primarily to an agency's interaction (permitted operations) with a set of monitors, while User Permissions relate to the specific operations that a user is allowed to perform for their assigned agency. (A user is only assigned to a single agency.)

5.5.2.1 Agency Roles

The following are the proposed agency roles that can be associated with a monitor in AQS:

Monitoring Agency

A monitoring organization as defined by 40 CFR Part 58 and the QA Handbook. ("a State, local, or other monitoring organization responsible for operating a monitoring site")

- Required
- Only 1 allowed per monitor at given date-time.

PQAO

40 CFR Part 58 Section 3.1 defines a PQAO as follows: "A primary quality assurance organization is defined as a monitoring organization or a coordinated aggregation of such organizations that is responsible for a set of stations that monitors the same pollutant and for which data quality assessments can logically be pooled."

- Required
- Only 1 allowed per monitor at given date-time.

Collecting Agency

A collecting agency is defined the agency that actually collects the data from the monitor/sampler, if different from the Monitoring Agency. (i.e. If a monitoring agency hires a contractor to operate the monitors at a site, then the contractor would be the collecting agency.)

Note: For continuous monitors, this would be the agency operating the data logger/data management system that collects the sample values from the monitor. For intermittent monitors (i.e. filter or canister), this would be the agency that picks up the sample collection media for the monitor.

- Not required.
- Only 1 allowed per monitor at given date-time.

Analyzing Agency

An analyzing agency is defined to be the agency (analyzing samples from monitor (i.e. Laboratory). Only required for non-continuous monitors (i.e. filter based or canister based monitors) where the analyzing agency is different than the Monitoring agency.

- Not required.
- Only 1 allowed per monitor at given date-time.

Submitting Agency

A submitting agency is defined to be the agency authorized to submit data to AQS if different than one of the other agencies. For example, if a Tribal consortium submits data to AQS for multiple tribes, then it would be the submitting agency (even though it is not otherwise involved in the monitoring process.) Note: The submitting agency would be allowed to submit "routine" data; i.e. Sample measurement data, 1-Point QC, Flow Rate Verifications, and etc.

- Not required.
- Multiple allowed per monitor at given date-time.

Audit Agency

Agency authorized to perform independent audits at a monitor (e.g. NPAP, PEP, and TSA assessments)

- Not required.
- Multiple allowed at a monitor at any given time.

Support Agency

Applies to Site only. Indicates the agency responsible for the site.

- Required
- Only 1 allowed per site at given date-time.

5.5.2.2 User Permissions

The following are the set of user permissions that could be assigned to a user for an agency.

None

The user is allowed read-only access to the data for the agency.

Site-Monitor Update

The user is allowed to create sites and monitors and to modify (update or delete) metadata at sites and monitors owned by the user's agency.

Routine Submitter

The user is allowed to submit Raw Data, Blanks data, 1-Point QC, Annual Performance Evaluations, Flow Rate Verifications, Semi-Annual Flow Rate Audits, and Lead Analysis Audits.

Independent Auditor

The user is allowed to submit independent QA/QC assessments (PEP, Lead PEP, NPAP, TSA, and etc.)

5.5.3 Interactions Among User Classes

A user with the Site-Monitor Update security role is allowed to assign other agency roles where the user's agency is the Monitoring Agency at a monitor.

5.5.4 Other Involved Personnel

Not Applicable.

5.5.5 Support Environment

The support environment for AQS is the EPA National Computer Center and the IT infrastructure that it provides. This consists of the following:

- An Oracle database for hosting the AQS data
- An Oracle Fusion Middleware (OFM) server for hosting the AQS application components (such as forms, reports, bulk load facilities, and web service components)
- The EPA Common Data Exchange to provide the interface between the EPA and submitting agencies.

All of these facilities are replicated to provide a production environment, a formal test (staging) environment, a disaster recovery environment, and a development environment.

6 Operational Scenarios

6.1 Registering a Quality Management Plan for a Monitoring Agency

1. Monitoring agency prepares and submits Quality Management Plan to Regional Office.
2. Regional office receives Quality Management Plan.
3. Regional office user with REGIONAL_ADMIN security role logs into AQS web application.
   a. User selects "Maintain QMP" from the AQS menu.
   b. User selects "data entry mode" and enters the following information: Monitoring Agency and Submission Date, and clicks SAVE.
4. Regional office staff review QMP and resolve any issues with monitoring agency (external to AQS).
5. When ready to approve QMP, regional office user with REGIONAL_ADMIN security role logs into AQS web application.
   a. User selects "Maintain QMP" from the AQS menu.
   b. User selects the monitoring agency from pick list and clicks "Execute Query"
   c. The AQS form retrieves the record for the submitted QMP.
   d. The Regional office user enters the Approval Date and clicks Save

6.2 Registering a Quality Assurance Project Plan for a Monitoring Agency

1. Monitoring agency or PQAO prepares and submits QAPP to Regional Office.
2. Regional office receives QAPP.
3. Regional office user with REGIONAL_ADMIN security role logs into AQS web application.
   a. User selects "Maintain QAPP" from the AQS menu.
   b. User selects "data entry mode" and enters the following information: Monitoring Agency (from pick list), Parameter Code (from multi-select pick list), and Submission Date, and clicks SAVE.
4. Regional office staff review QAPP and resolve any issues with monitoring agency (external to AQS).
5. When ready to approve QAPP, regional office user with REGIONAL_ADMIN security role logs into AQS web application.
   a. User selects "Maintain QAPP" from the AQS menu.
   b. User selects the monitoring agency from pick list and optionally the parameter code, and clicks "Execute Query"
   c. The AQS form retrieves the record for the submitted QMP.
   d. User enters the Approval Date and clicks Save

6.3 Recording a TSA or ADQ

1. Regional office staff, or independent quality organization, conducts TSA or ADQ.
2. Authorized staff member (with either REGIONAL_ADMIN, or INDEPENDENT_AUDITOR role), logs into AQS web application.
   a. User selects "Maintain TSA/ADQ" from AQS menu.
   b. User selects "data entry mode" and enters the following information: Monitoring agency, Performing agency, date assessment began, date assessment completed, closeout date. (Note: Performing agency is defaulted to the user's agency.)
   c. User clicks SAVE.

6.4 Submitting an Assessment via AQS Batch Load

1. Monitoring agency prepares file of assessment transactions. These can be either the new QA transactions or the legacy RA and RP transactions (or a mixture of both). These can be in either the AQS delimited format or an XML document.
2. Authorized user submits file to either the ENSC or their agency Exchange Network node.
3. Exchange network submits file to AQS for automatic processing.
4. AQS processes transactions in order submitted. For each transaction, AQS performs the following:
   a. AQS verifies that user is authorized to perform action associated with transaction (based on Monitor Agency Roles and security roles assigned to user.
   b. AQS attempts to insert/update/delete data in production tables. If the operation fails, the transaction is saved in the Staging Tables.
   c. When processing of the file is complete, AQS notifies (via email) the user and makes the Load report available to the user for download.
5. If there were any errors, the user logs into the AQS web application and accesses the Correct QA form.
   a. The user retrieves any transactions with errors.
   b. The user corrects the errors (possibly by using the pick list for every field to select valid values).
   c. The user clicks SAVE.
6. The user accesses the AQS Batch form.
7. The user selects the file previously submitted and clicks LOAD.
8. If no errors are reported, the process is complete. If any errors are reported, the user again accesses the Correct QA form (step 5).

6.5 On-line Editing of an Assessment

1. The user logs into the AQS web application.
2. The user selects the maintain form for the desired assessment type from the AQS menu.
3. AQS displays the maintain form for that assessment.
4. The user enters the query criteria for the set of records to be changed, and clicks "Execute Query"
5. AQS retrieves the records matching the user's criteria.
6. The user changes the desired fields and AQS validates the changes as each field is changed.
7. If the user wants to delete the assessment, they click the "Delete Record" icon.
8. If the user wants to create a new assessment, they click the "Create Record" icon and enter all of the fields.
9. When complete, the user clicks SAVE.

6.6 Reviewing Raw Assessments Data

1. User logs into AQS Web Application.
2. User selects "Standard Retrievals" from AQS menu, and AQS displays the standard retrievals user interface (R31).
3. User selects "QA/QC Raw Data Report" (AMP250)
4. User selects destination – Batch or On-Line
5. User enters selection criteria – PQAO, geography, parameters, and methods, date range.
6. User clicks "Generate Report" and AQS generates report and delivers to user via web.

6.7 Extracting Previously-Reported Assessment Data

1. User logs into AQS Web Application.
2. User selects "Standard Retrievals" from AQS menu, and AQS displays the standard retrievals user interface (R31).
3. User selects "Extract QA/QC Data" (AMP502)
4. User enters file type desired – Delimited or XML.
5. User enters selection criteria – PQAO, geography, parameters, and methods, date range.
6. User clicks "Generate Report" and AQS generates file and delivers to user via web

6.8 Reviewing Appendix A Statistics

1. User logs into AQS Web Application.
2. User selects "Standard Retrievals" from AQS menu, and AQS displays the standard retrievals user interface (R31).
3. User selects "Data Quality Indicator Report" (AMP255)

4. User selects destination – Batch or On-Line
5. User selects output type – Formatted report (PDF) or workfile.
6. User enters selection criteria – PQAO, geography, parameters, and methods, date range.

User clicks "Generate Report" and AQS generates report and delivers to user via web.

6.9 On-Line Registering a Monitor Method

1. User logs into the AQS web application
2. User selects "Maintain Monitor" from the AQS menu, and AQS displays the Maintain Monitor form.
3. User enters query criteria to retrieve existing monitor and clicks "Execute Query"
4. User clicks on "Methods" tab
5. Clicks "Insert Record" to begin data entry, and enters the following information:
   a. Method Code (from pick list)
   b. Begin Date (required)
   c. End Date (optional)
6. User clicks SAVE.

6.10 Registering a Monitor Method via Batch

1. User creates file containing Monitor Method (MM) delimited transaction or XML document.
2. Authorized user submits file to either the ENSC or their agency Exchange Network node.
3. Exchange network submits file to AQS for automatic processing.
4. AQS processes transactions in order submitted. For each transaction, AQS performs the following:
   a. AQS verifies that user is authorized to modify site-monitor metadata, based on Monitor Agency Roles and security roles assigned to user.
   b. AQS attempts to insert/update/delete data in production tables. If the operation fails, the transaction is saved in the Staging Tables.
   c. When processing of the file is complete, AQS notifies (via email) the user and makes the Load report available to the user for download.
5. If there were any errors, the user logs into the AQS web application and accesses the Correct Monitor-Method form.
   a. The user retrieves any transactions with errors.
   b. The user corrects the errors (possibly by using the pick list for every field to select valid values).
   c. The user clicks SAVE.

6. The user accesses the AQS Batch form.
7. The user selects the file previously submitted and clicks LOAD.
8. If no errors are reported, the process is complete. If any errors are reported, the user again accesses the Correct Monitor-Method form (step 5).

7 Summary of Impacts

7.1 Operational Impacts

1. For QA/QC related data, access control will be determined by Monitor Agency Roles rather than by Screening Groups.

7.2 Organizational Impacts

1. Monitoring agencies will be responsible to identify the methods associated with each AQS monitor.
2. Regional offices will be responsible for the following new actions:
   a. Logging receipt of QMPs and QAPPs received from the monitoring agencies and/or PQAOs.
   b. Indicating approval of QMPs and QAPPs in AQS.
   c. Logging initiation and status of TSAs and ADQs in AQS.

7.3 Impacts During Development

None.

8 Analysis of Proposed System

8.1 Summary of Proposed Improvements

1. Support for QA/QC assessments not previously allowed by AQS.
2. Simpler and easier to understand transaction formats for QA/QC data. (This is expected to result in a net reduction in operational cost for submitting agencies because of a reduction in error rates and resources for correction of errors.)

8.2 Disadvantages and Limitations

1. Cost of software changes to implement new capabilities.

8.3 Alternatives and Trade-offs Considered

None.

9 Appendices

None.